CLAIMS

1 A method of communication between a transmitting node and a receiving node, characterized in that:

the transmitting node provides a first group flow having one flow or more based upon a first criterion relating to a sequencing and a second group flow having one flow or more based upon a second criterion relating to a retransmitting control, assigns a first identifier to each flow belonging to said first group flow, said first identifier being unique, and assigns a second identifier to each flow belonging to said second group flow, said second identifier being unique; and

the transmitting node classifies the packets, which were input, into one flow or more belonging to said first group flow, based upon said first criterion, yet classifies them into one flow or more belonging to said second group flow, based upon said second criterion, affixes to said packets said first identifier, a first sequential number, said first sequential number being unique within flows specified by said first identifier, said second identifier, a second sequential number, said second sequential number being unique within flows specified by said second identifier, and transmit them;

the receiving node classifies all received packets

based upon the second identifier, and checks the packets having the second sequential number, which were not received, with each second group flow, and requests the transmitting node of retransmission thereof;

the transmitting node retransmits the packets of the second group flow having the second sequential number requested by the receiving node; and

the receiving node classifies all received packets based upon the first identifier, sequences the packets within each first group flow based upon the first sequential number, and performs a receiving process of the sequenced packets in the sequenced order.

2 The communication method according to claim 1, characterized in that the transmitting node and the receiving node are connected via one communicating path, the second group flow of the transmitting node is comprised of a single flow, and the packets are transmitted by utilizing a single communicating path.

3 The communication method according to claim 1, characterized in that in a case where a plurality of communicating paths for transmitting the packet exist, the transmitting node selects the communicating path for transmitting the packet, based upon a third criterion

relating to a schedule of the packet transmission.

4 The communication method according to claim 3, characterized in that the transmitting node and the receiving node are connected via a plurality of communicating paths, and the transmitting node classifies the packets into unique flows corresponding to the communicating paths, through which the packets to be transmitted pass, as a second criterion, and selects the communicating path in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

5 The communication method according to claim 3, characterized in that the transmitting node and the receiving node are connected via a plurality of communicating paths, and the transmitting node classifies the packets into the flows of which the number is fewer than the number of the communicating paths, through which the packets to be transmitted pass, as a second criterion, and selects the communicating path in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

6 The communication method according to claim 1, characterized in that the transmitting node is a transmitting-side transferring node for transferring the packet, transmitted by a separate communicating node, and the receiving node is a receiving-side transferring node for transferring the packet, received by a separate communicating node.

7 The communication method according to claim 6, characterized in that the transmitting node and the receiving node are connected via one communicating path, the second group flow of the transmitting node is comprised of a single flow, and the packets are transmitted by utilizing a single communicating path.

8 The communication method according to claim 6, characterized in that the transmitting node and the receiving node are connected via a plurality of communicating paths, and the transmitting node classifies the packets into unique flows corresponding to the communicating paths, through which the packets to be transmitted pass, as a second criterion, and selects the communicating path in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

9 The communication method according to claim 6, characterized in that the transmitting node and the receiving node are connected via a plurality of communicating paths, and the transmitting node classifies the packets into the flows of which the number is fewer than the number of the communicating paths, through which the packets to be transmitted pass, as a second criterion, and selects the communicating path in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

10 The communication method according to claim 3, characterized in that selection of the path or a decision of a selection priority thereof is made in the transmitting node as a third criterion of the transmitting node, where path selection or path selection priority update is performed upon every packet to be input, based on path status information on a selectable path, based on identification information on a time from which said path status information is effective or on a transmitted packet, and based on a transmission history after the time from which said path status information is effective or a transmission history after transmission of the packet

specified with transmitted packet identification information.

11 The communication method according to claim 10, wherein said path status information includes a delay of a path.

12 The communication method according to claim 10, wherein said path status information includes a transmission rate of a path.

13 The communication method according to claim 10, wherein said path status information includes a load of a path.

14 The communication method according to claim 10, further comprising the step of correcting a transmission cost calculation result regarding a packet transmitted before updating path status information of each path, when the path status information is updated for path selection or selection priority update.

15 The communication method according to claim 14, further comprising the step of discarding a history prior to a first packet transmitted on or after a time from

which the latest path status information is effective, when a transmission cost calculation result of each path is corrected.

16 The communication method according to claim 10, further comprising the step of selecting as a packet transmission path a path having an earliest estimation value of a reception completion time at a reception node.

17 The communication method according to claim 10, further comprising the step of selecting as a packet transmission path a path having a largest estimation value of a data amount, which can be completely received by a specific time at a reception node.

18 The communication method according to claim 10, further the step of interrupting data transmission according to an estimated current path status in each path.

19 The communication method according to claim 18, wherein a condition for interruption of said data transmission is that an estimated reception completion time is equal to or greater than a specific value.

20 The communication method according to claim 10,

characterized in that path selection or a determination of a transmission interruption is made according to the policy, which differs every attribution of transmission data.

21 A node, said node being configured of a transmitting section for transmitting a packet and a receiving section for receiving the packet and taking a retransmitting control and a sequencing of the packet independently, characterized in that:

said transmitting section includes:

a means for affixing to the transmission packet a first identifier, said first identifier being assigned in a one-to-one manner to each flow of a first group flow based upon a first criterion relating to a sequencing, a first sequential number, said first sequential number being unique within each flow belonging to said first group flow, a second identifier, said second identifier being assigned in a one-to-one manner to each flow of a second group flow based upon a second criterion relating to a retransmitting control, and a second sequential number, said second sequential number being unique within each flow belonging to said second group flow, to transmit it; and

a means for specifying the packet, for which

retransmission was requested by the node having received the packet, from said second identifier and second sequential number to retransmit its packet: and that

said receiving section includes:

a means for classifying all received packets based upon said second identifier to check the packets having the second sequential number, which were not received, with each second group flow to transmit its second identifier and second sequential number to the node having transmitted the packet, and to request retransmission thereof; and

a means for classifying all received packets based upon said first identifier to sequence the packets within each first group flow based upon said first sequential number to perform a receiving process of the sequenced packets in the sequenced order.

22 The node according to claim 21, characterized in that each of nodes is connected to the other via one communicating path, the second group flow is comprised of a single flow, and the packet is transmitted by utilizing a single communicating path.

23 The node according to claim 21, characterized in, in a case where a plurality of communicating paths for

transmitting the packet exist, including a means for selecting the communicating path for transmitting the packet, based upon a third criterion relating to a schedule of the packet transmission.

24 The node according to claim 23, characterized in that each of the nodes is connected to the other via a plurality of communicating paths, and the packets are classified into unique flows corresponding to the communicating paths, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

25 The node according to claim 23, characterized in that, each of the nodes is connected to the other via a plurality of communicating paths, the packets are classified into the flows of which the number is fewer than the number of the communicating paths, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third

criterion.

26 The node according to claim 21, characterized in that the transmitting section of the node is a transferring-side transferring node for transferring the packet transmitted by a separate communicating node, and the receiving section of the node is a receiving-side transferring node for transferring the packet received by a separate communicating node.

27 The node according to claim 26, characterized in that each of the nodes is connected to the other via one communicating path, the second group flow is comprised of a single flow, and the packets are transmitted by utilizing a single communicating path.

28 The node according to claim 26, characterized in that each of the nodes is connected to the other via a plurality of communicating paths, the packets are classified into unique flows corresponding to the communicating path, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third

criterion.

29 The node according to claim 26, characterized in that each of the nodes is connected to the other via a plurality of communicating paths, the packets are classified into the flows of which the number is fewer than the number of the communicating paths, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

30 The node according to claim 23, wherein said means for selecting the communicating path makes selection of the path or a decision of a selection priority thereof is made in the transmitting node as a third criterion, where path selection or path selection priority update is performed upon every packet to be input, based on path status information on a selectable path, based on identification information on a time from which said path status information is effective or on a transmitted packet, and based on a transmission history after the time from which said path status information is effective or a transmission history after transmission of the packet

specified with transmitted packet identification information.

31 The node according to claim 30, wherein said path status information includes a delay of a path.

32 The node according to claim 30, wherein said path status information includes a transmission rate of a path.

33 The node according to claim 30, wherein said path status information includes a load of a path.

34 The node according to claim 30, wherein said means for selecting the communicating path corrects a transmission cost calculation result regarding a packet transmitted prior or updating when path status information of each path is updated in the updating of path selection or selection priority.

35 The node according to claim 34, wherein said means for selecting the communicating path discards a history before a first transmitted packet validating latest path status information when a transmission cost calculation result of each path is corrected.

36 The node according to claim 30, wherein said means for selecting the communicating path selects as a packet transmission path a path having an earliest estimation value of a reception completion time at a reception node.

37 The node according to claim 30, wherein said means for selecting the communicating path selects as a packet transmission path a path having a largest estimation value of a data amount which can be completely received by a specific time at a reception node.

38 The node according to claim 30, wherein said means for selecting the communicating path interrupts data transmission according to an estimated current path status for each path.

39 The node according to claim 38, wherein a condition for interruption of said data transmission is that an estimated reception completion time is equal to or greater than a specific value.

40 The node according to claim 30, wherein said means for selecting the communicating path determines the interruption of path selection or transmission according to a policy different every attribute of a transmission

data.

41 A controlling program for a node, said node taking a retransmitting control and a sequencing of a packet independently, characterized in that said controlling program causes said node to function as:

a means for affixing to the transmission packet a first identifier, said first identifier being assigned in a one-to-one manner to each flow of a first group flow based upon a first criterion relating to a sequencing, a first sequential number, said first sequential number being unique within each flow belonging to said first group flow, a second identifier, said second identifier being assigned in a one-to-one manner to each flow of a second group flow based upon a second criterion relating to a retransmitting control, and a second sequential number, said second sequential number being unique within each flow belonging to said second group flow, to transmit it;

a means for specifying the packet, for which retransmission was requested by the node having received the packet, from said second identifier and second sequential number to retransmit its packet;

a means for classifying all received packets based upon said second identifier to check the packets having

the second sequential number, which were not received, with each second group flow to transmit its second identifier and second sequential number to the node having transmitted the packet, and to request retransmission thereof; and

a means for classifying all received packets based upon said first identifier to sequence the packets based upon said first sequential number with each first group flow, and to perform a receiving process of the sequenced packets in the sequenced order.

42 The controlling program for a node according to claim 41, characterized in each of nodes is connected to the other via one communicating path, the second group flow is comprised of a single flow, and the packet is transmitted by utilizing a single communicating path.

43 The controlling program for a node according to claim 41, characterized in, in a case where a plurality of communicating paths for transmitting the packet exist, causing said node to function as a means for selecting the communicating path for transmitting the packet based upon a third criterion relating to a schedule of the packet transmission.

44 The controlling program for a node according to claim 43, characterized in each of the nodes is connected to the other via a plurality of communicating paths, and the packets are classified into unique flows corresponding to the communicating paths, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

45 The controlling program for a node according to claim 43, characterized in that each of the nodes is connected to the other via a plurality of communicating paths, the packets are classified into the flows of which the number is fewer than the number of the communicating paths, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

46 The controlling program for a node according to claim 41, characterized in that the transmitting section of the node is a transmitting-side transferring node for

transferring the packet, transmitted by a separate communicating node, and the receiving section of the node is a receiving-side transferring node for transferring the packet, received by a separate communicating node.

47 The controlling program for a node according to claim 46, characterized in that each of the nodes is connected to the other via one communicating path, the second group flow is comprised of a single flow, and the packets are transmitted by utilizing a single communicating path.

48 The controlling program for a node according to claim 46, characterized in that each of the nodes is connected to the other via a plurality of communicating paths, the packets are classified into unique flows corresponding to the communicating paths, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

49 The controlling program for a node according to claim 46, characterized in that each of the nodes is connected to the other via a plurality of communicating paths, the

packets are classified into the flows of which the number is fewer than the number of the communicating paths, through which the packets to be transmitted pass, as a second criterion, and the communicating path is selected in retransmitting the packets independently of the communicating path selected at the time of the first transmission as a third criterion.

50 The controlling program for a node according to claim 43, characterized in causing said means for selecting the communicating path to make selection of the path or a decision of a selection priority thereof is made in the transmitting node as a third criterion, where path selection or path selection priority update is performed upon every packet to be input, based on path status information on a selectable path, based on identification information on a time from which said path status information is effective or on a transmitted packet, and based on a transmission history after the time from which said path status information is effective or a transmission history after transmission of the packet specified with transmitted packet identification information.

51 The controlling program for a node according to claim

50, wherein said path status information includes a delay of a path.

52 The controlling program for a node according to claim 50, wherein said path status information includes a transmission rate of a path.

53 The controlling program for a node according to claim 50, wherein said path status information includes a load of a path.

54 The controlling program for a node according to claim 50, further controlling said means for selecting the communicating path so as to correct a transmission cost calculation result regarding a packet transmitted prior or updating when path status information of each path is updated in the updating of path selection or selection priority.

55 The controlling program for a node according to claim 54, further controlling said means for selecting the communicating path so as to discard a history before a first transmitted packet validating latest path status information when a transmission cost calculation result of each path is corrected.

56 The controlling program for a node according to claim 50, further controlling said means for selecting the communicating path so as to select as a packet transmission path a path having an earliest estimation value of a reception completion time at a reception node.

57 The controlling program for a node according to claim 50, further controlling said means for selecting the communicating path so as to select as a packet transmission path a path having a largest estimation value of a data amount which can be completely received by a specific time at a reception node.

58 The controlling program for a node according to claim 50, further controlling said means for selecting the communicating path so as to interrupt data transmission according to an estimated current path status for each path.

59 The controlling program for a node according to claim 58, wherein a condition for interruption of said data transmission is that an estimated reception completion time is equal to or greater than a specific value.

60 The controlling program for a node according to claim 50, further controlling said means for selecting the communicating path so as to determine path selection or transmission interruption according to a policy different every attribute of transmission data.

61 A communicating method, characterized in affixing an identifier for identifying a transmission flow and a sequential number within said transmission flow to a communication packet in addition to information for a sequencing to take a retransmitting control thereof per transmission flow on the receiving side, based upon said identifier and said sequential number.

62 A communicating method, characterized in affixing an identifier for identifying a transmission flow and a sequential number within said transmission flow to a communication packet in addition to information for a sequencing to detect a loss of the packet per transmission flow on the receiving side, based upon said identifier and said sequential number.

63 A node, characterized in including:

a means for affixing to the packet a first identifier, said first identifier being assigned in a one-to-one

manner to each flow of a first group flow based upon a first criterion relating to a sequencing, a first sequential number, said first sequential number being unique within each flow belonging to said first group flow, a second identifier, said second identifier being assigned in a one-to-one manner to each flow of a second group flow based upon a second criterion relating to a retransmitting control, and a second sequential number, said second sequential number being unique within each flow belonging to said second group flow, to transmit it; and

a means for retransmitting the lost packets, which were detected, per transmission flow based upon said second identifier and said second sequential number.

64 A controlling program of a node, characterized in causing said node to function as:

a means for affixing to the packet a first identifier, said first identifier being assigned in a one-to-one manner to each flow of a first group flow based upon a first criterion relating to a sequencing, a first sequential number, said first sequential number being unique within each flow belonging to said first group flow, a second identifier, said second identifier being assigned in a one-to-one manner to each flow of a second group flow based upon a second criterion relating to a retransmitting

control, and a second sequential number, said second sequential number being unique within each flow belonging to said second group flow, to transmit it; and

a means for retransmitting the lost packets, which were detected, per transmission flow based upon said second identifier and said second sequential number.